

CLAIMS:

1. Sensor probe means adapted for positioning in a flow of humidified gases comprising:

5 sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

sensing means housed within said sensor housing means at or near said sensing end, and

10 at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

15 2. Sensor probe means as claimed in claim 1 wherein said sensor probe means comprise two said projecting tab means.

3. Sensor probe means as claimed in claim 1 or claim 2 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

20 4. Sensor probe means as claimed in claim 1 or claim 2 wherein each said at least one projecting tab means is aligned parallel to said gases flow.

25 5. Sensor probe means as claimed in claim 1 or claim 2 wherein liquid condensate is dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

30 6. Sensor probe means as claimed in claim 1 or claim 2 wherein said sensor probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

7. Sensor probe means as claimed in claim 6 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

5 8. Sensor probe means as claimed in claim 6 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow, and the power required by said sensor means of said flow rate sensor housing means to maintain said
10 predetermined difference temperature providing an indication of the flow rate of said gases.

9. Sensor probe means as claimed in claim 6 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the flow rate sensor housing means while the sensing means of said temperature sensor housing
15 means is encapsulated at or near the sensing end of the temperature sensor housing means.

10. Sensor probe means as claimed in claim 6 wherein said temperature and flow rate sensor housing means are spaced across said gases flow in order that heat
20 produced by the sensing means of said flow rate sensor housing means has substantially minimal effect on the sensing means of said temperature sensor housing means.

11. Sensor probe means as claimed in claim 6 wherein said flow rate sensor housing means is positioned up stream of said temperature sensor housing means in
25 order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

12. Sensor probe means as claimed in claim 1 or claim 2 wherein said gases flow
30 is channelled within a conduit of known cross-sectional area, at least in the region adjacent said sensor probe means, and is provided with a sensor entry port adapted to

✓ receive said sensor probe means, said sensor entry port being provided with a fixed locating depression and said sensor probe means being provided with a complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing means relative to said gases flow being controlled by the
5 interconnection of said locating depression and tooth.

13. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having
10 an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said
15 humidification chamber means,

gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases,

flow probe means adapted to sense the flow rate of said gases flow,
20 temperature sensing means adapted to sense the temperature of said gases flow,

user input means to allow a user to set a required temperature of said gases flow,

control means which receives input from said flow probe means, said
25 temperature sensing means and said user input means and controls said heating means in response to said inputs to maintain said gases flow at said required temperature.

14. Humidification apparatus as claimed in claim 13 wherein said input from said
30 flow probe means in combination with said input from said temperature sensing means allows said control means to determine if the humidification apparatus is in a

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normal operating condition or if abnormal operation has occurred.

15. Humidification apparatus as claimed in claim 13 or claim 14 wherein said flow probe means comprises:

5 sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

sensing means housed within said sensor housing means at or near said sensing end, and

10 at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

15 16. Humidification apparatus as claimed in claim 15 wherein said flow probe means comprise two said projecting tab means.

17. Humidification apparatus as claimed in claim 15 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

20 18. Humidification apparatus as claimed in claim 15 wherein each said at least one projecting tab means is aligned parallel to said gases flow.

25 19. Humidification apparatus as claimed in claim 15 wherein liquid condensate is dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

30 20. Humidification apparatus as claimed in claim 15 wherein said flow probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

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21. Humidification apparatus as claimed in claim 20 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

5 22. Humidification apparatus as claimed in claim 20 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow, the power required by said sensor means of said flow rate sensor housing means to maintain said
10 predetermined difference temperature providing an indication of the flow rate of said gases.

23. Humidification apparatus as claimed in claim 20 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the flow rate sensor housing means while the sensing means of said temperature sensor
15 housing means is encapsulated at or near the sensing end of the temperature sensor housing means.

24. Humidification apparatus as claimed in claim 20 wherein said temperature and flow rate sensor housing means are spaced across said gases flow in order that
20 heat produced by the sensing means of said flow rate sensor housing means has substantially minimal effect on the sensing means of said temperature sensor housing means.

25. Humidification apparatus as claimed in claim 20 wherein said flow rate sensor housing means is positioned up stream of said temperature sensor housing means in order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

30 26. Humidification apparatus as claimed in claim 15 wherein said gases transportation pathway means has a known cross-sectional area, at least in the region

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adjacent said flow probe means, and is provided with a sensor entry port adapted to receive said flow probe means, said sensor entry port being provided with a fixed locating depression and said flow probe means being provided with a complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing means relative to said gases flow being controlled by the interconnection of said locating depression and tooth.

27. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means, said heating means utilising a measurable quantity of power,

gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases,

flow probe means adapted to sense the flow rate of said gases flow,

control means which receives input from said flow probe means and storing a program which causes the control means to:

i) calculate the power usage required of said heating means in order to humidify said gases flow to a predetermined level at the gases flow rate sensed by said flow probe means,

ii) determine the power presently being utilised by said heating means, and

iii) supply said predetermined level of power to said heating means if the determined present power utilisation of said heating means is less than said required power usage.

28. Humidification apparatus as claimed in claim 27 wherein said step of calculating the power usage required of said heating means in order to humidify said gases flow comprises sensing the present gases flow by said flow probe means and searching in a data storage means for a previously stored power value associated with said sensed gases flow rate, said data storage means being previously supplied with flow rate and associated power usage values.

29. Humidification apparatus as claimed in claim 27 or claim 28 wherein said step of calculating the power usage required of said heating means in order to humidify said gases flow also comprises the steps of calculating the rate of evaporation required in order to attain said predetermined level at the sensed gases flow rate and then determining the power required of said heating means to produce the required said rate of evaporation.

30. Humidification apparatus as claimed in claim 27 or claim 28 wherein said humidification apparatus also comprises a temperature sensing means adapted to sense the temperature of said gases flow leaving said humidification chamber means and to supply a temperature signal to said control means and said program stored by said control means includes, between said steps (ii) and (iii), the step of:

 iia) controlling the energisation of said heating means in order to maintain said gases flow rate exiting said humidification chamber means at a predetermined temperature.

31. Humidification apparatus as claimed in claim 27 or claim 28 wherein said program stored by said control means also comprise the subsequent step of:

 iv) sensing the temperature of the gases leaving the humidification chamber means and returning to step (i) when the sensed temperature is less than said predetermined temperature.

32. Humidification apparatus as claimed in claim 27 or claim 28 wherein said flow probe means comprises:

sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

sensing means housed within said sensor housing means at or near said sensing end, and

at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

33. Humidification apparatus as claimed in claim 32 wherein said flow probe means comprise two said projecting tab means.

34. Humidification apparatus as claimed in claim 32 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

35. Humidification apparatus as claimed in claim 32 wherein each said at least one projecting tab means is aligned parallel to said gases flow.

36. Humidification apparatus as claimed in claim 32 wherein liquid condensate is dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

37. Humidification apparatus as claimed in claim 32 wherein said flow probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

38. Humidification apparatus as claimed in claim 37 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

39. Humidification apparatus as claimed in claim 37 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow, the power required by said sensor means of said flow rate sensor housing means to maintain said
5 predetermined difference temperature providing an indication of the flow rate of said gases.

40. Humidification apparatus as claimed in claim 37 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the
10 flow rate sensor housing means while the sensing means of said temperature sensor housing means is encapsulated at or near the sensing end of the temperature sensor housing means.

41. Humidification apparatus as claimed in claim 37 wherein said temperature
15 and flow rate sensor housing means are spaced across said gases flow in order that heat produced by the sensing means of said flow rate sensor housing means has substantially no effect on the sensing means of said temperature sensor housing means.

42. Humidification apparatus as claimed in claim 37 wherein said flow rate
20 sensor housing means is positioned up stream of said temperature sensor housing means in order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

43. Humidification apparatus as claimed in claim 32 wherein said gases
25 transportation pathway means has a known cross-sectional area, at least in the region adjacent said sensor probe means, and is provided with a sensor entry port adapted to receive said flow probe means, said sensor entry port being provided with a fixed
30 locating depression and said flow probe means being provided with a complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing

means relative to said gases flow being controlled by the interconnection of said locating depression and tooth.

44. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means,

gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases,

flow probe means adapted to sense the flow rate of said gases flow,

temperature sensing means adapted to sense the temperature of said gases flow,

user input means to allow a user to select a desired gases humidity level of said gases flow,

data storage means containing information on target gases temperatures at various gases flow rates for a number of humidification chamber outlet means temperatures,

control means which receives input from said temperature sensing means and said user input means and using said flow information from said flow probe means repeatedly obtains corresponding target temperature information from said data storage means corresponding to the desired gases humidity level and varies the heat provided by said heating means until the sensed temperature is substantially equivalent to said target temperature in order to obtain said desired gases humidity level.

45. Humidification apparatus as claimed in claim 44 wherein said gases transportation pathway means includes a heating wire means adapted to, upon energisation to a setting determined by said control means, supply heat to said gases flow between said humidification means outlet and said patient or other person in need to such gases and wherein said control means thereby controls temperature changes in said gases flow along said gases transportation pathway, said control means adjusting said setting of said heating wire to control the temperature of said gases flow delivered to said patient or other person in need of such gases to a user set desired temperature.

46. Humidification apparatus as claimed in claim 44 or claim 45 wherein said flow probe means comprises:

sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

sensing means housed within said sensor housing means at or near said sensing end, and

at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

47. Humidification apparatus as claimed in claim 46 wherein said flow probe means comprise two said projecting tab means.

48. Humidification apparatus as claimed in claim 46 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

49. Humidification apparatus as claimed in claim 46 wherein each said at least one projecting tab means is aligned parallel to said gases flow.

50. Humidification apparatus as claimed in claim 46 wherein liquid condensate is

dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

5 51. Humidification apparatus as claimed in claim 46 wherein said flow probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

10 52. Humidification apparatus as claimed in claim 51 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

15 53. Humidification apparatus as claimed in claim 51 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow and the power required by said sensor means of said flow rate sensor housing means to maintain said predetermined difference temperature providing an indication of the flow rate of said gases.

20 54. Humidification apparatus as claimed in claim 51 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the flow rate sensor housing means while the sensing means of said temperature sensor housing means is encapsulated at or near the sensing end of the temperature sensor housing means.

25 55. Humidification apparatus as claimed in claim 51 wherein said temperature and flow rate sensor housing means are spaced across said gases flow in order that heat produced by the sensing means of said flow rate sensor housing means has substantially minimal effect on the sensing means of said temperature sensor
30 housing means.

56. Humidification apparatus as claimed in claim 51 wherein said flow rate sensor housing means is positioned up stream of said temperature sensor housing means in order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

57. Humidification apparatus as claimed in claim 46 wherein said gases transportation pathway means has a known cross-sectional area, at least in the region adjacent said sensor probe means, and is provided with a sensor entry port adapted to receive said flow probe means, said sensor entry port being provided with a fixed locating depression and said flow probe means being provided with a complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing means relative to said gases flow being controlled by the interconnection of said locating depression and tooth.

58. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means,

gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases,

flow probe means adapted to sense the flow rate of said gases flow,
temperature sensing means adapted to sense the temperature of said gases flow,

user input means which may be in one of a predetermined number of states

corresponding to one of a number of gases delivery configurations, each configuration optimally requiring a predetermined gases temperature and humidity level,

control means which receives input from said flow probe means, said temperature sensing means and said user input means and controls said heating means to provide said gases flow to said patient or other person in need of such gases at a temperature and humidity level as indicated by said user input means.

59. Humidification apparatus as claimed in claim 58 wherein said user input means comprise a two state input device with a first state corresponding to an intubated gases delivery configuration and a second state corresponding to an intact airways gases delivery configuration.

60. Humidification apparatus as claimed in claim 59 wherein said intubated gases delivery configuration comprises delivering gases at a temperature of about 37°C and a humidity of about 44mg H₂O per litre of gases and said intact airways gases delivery configuration comprises delivering gases at a temperature of about 32°C and a humidity level of about 30mg H₂O per litre of gases.

61. Humidification apparatus as claimed in claim 58 or claim 59 wherein said control means receives input from said flow probe means and stores a program which causes the control means to:

i) calculate the power usage required of said heating means in order to humidify said gases flow to a predetermined level at the gases flow rate sensed by said flow probe means,

ii) determine the power presently being utilised by said heating means, and

iii) supply said predetermined level of power to said heating means if the determined present power utilisation of said heating means is less than said required power usage.

62. Humidification apparatus as claimed in claim 61 wherein said step of

calculating the power usage required of said heating means in order to humidify said gases flow comprises sensing the present gases flow by said flow probe means and searching in a data storage means for a previously stored power value associated with said sensed gases flow rate, said data storage means being previously supplied with flow rate and associated power usage values.

63. Humidification apparatus as claimed in claim 61 wherein said step of calculating the power usage required of said heating means in order to humidify said gases flow also comprises the steps of calculating the rate of evaporation required in order to attain said predetermined level at the sensed gases flow rate and then determining the power required of said heating means to produce the required said rate of evaporation.

64. Humidification apparatus as claimed in claim 61 wherein said program stored by said control means includes, between said steps (ii) and (iii), the step of:

 iia) controlling the energisation of said heating means in order to maintain said gases flow rate exiting said humidification chamber means at a predetermined temperature.

65. Humidification apparatus as claimed in claim 61 wherein said program stored by said control means also comprise the subsequent step of:

 iv) sensing the temperature of the gases leaving the humidification chamber means and returning to step (i) when the sensed temperature is less than said predetermined temperature.

66. Humidification apparatus as claimed in claim 61 wherein said humidification apparatus also comprise data storage means containing information on target gases temperatures at various gases flow rates for a number of humidification chamber outlet means temperatures and said control means receives input from said temperature sensing means and said user input means and using said flow information from said flow probe means repeatedly obtains corresponding target

temperature information from said data storage means corresponding to the desired gases humidity level and varies the heat provided by said heating means until the sensed temperature is substantially equivalent to said target temperature in order to obtain said desired gases humidity level.

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67. Humidification apparatus as claimed in claim 58 or claim 59 wherein said gases transportation pathway means includes a heating wire means adapted to, upon energisation to a setting determined by said control means, supply heat to said gases flow between said humidification means outlet and said patient or other person in need to such gases and wherein said control means thereby controls temperature changes in said gases flow along said gases transportation pathway, said control means adjusting said setting of said heating wire to control the temperature of said gases flow delivered to said patient or other person in need of such gases to a user set desired temperature.

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68. Humidification apparatus as claimed in claim 58 or claim 59 wherein said flow probe means comprises:

sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

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sensing means housed within said sensor housing means at or near said sensing end, and

at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

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69. Humidification apparatus as claimed in claim 68 wherein said flow probe means comprise two said projecting tab means.

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70. Humidification apparatus as claimed in claim 68 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

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71. Humidification apparatus as claimed in claim 68 wherein each said at least one projecting tab means is aligned parallel to said gases flow.

5 72. Humidification apparatus as claimed in claim 68 wherein liquid condensate is dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

10 73. Humidification apparatus as claimed in claim 68 wherein said flow probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

15 74. Humidification apparatus as claimed in claim 73 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

20 75. Humidification apparatus as claimed in claim 73 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow and the power required by said sensor means of said flow rate sensor housing means to maintain said predetermined difference temperature providing an indication of the flow rate of said gases.

25 76. Humidification apparatus as claimed in claim 73 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the flow rate sensor housing means while the sensing means of said temperature sensor housing means is encapsulated at or near the sensing end of the temperature sensor housing means.

30 77. Humidification apparatus as claimed in claim 73 wherein said temperature and flow rate sensor housing means are spaced across said gases flow in order that

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5 78. Humidification apparatus as claimed in claim 73 wherein said flow rate sensor housing means is positioned up stream of said temperature sensor housing means in order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

79. Humidification apparatus as claimed in claim 68 wherein said gases transportation pathway means has a known cross-sectional area, at least in the region adjacent said sensor probe means, and is provided with a sensor entry port adapted to receive said flow probe means, said sensor entry port being provided with a fixed locating depression and said flow probe means being provided with a complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing means relative to said gases flow being controlled by the interconnection of said locating depression and tooth.

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases, said gases transportation pathway means having a

patient end, distal to said end connected to said outlet of said humidification chamber means,

first temperature sensing means adapted to sense the temperature of said gases flow substantially at said outlet of said humidification chamber means,

5 second temperature sensing means adapted to sense the temperature of said gases flow substantially at said patient end of said gases transportation pathway means,

display means adapted to display temperature information to a user,

10 control means which receives input from said first temperature sensing means and outputs a signal to said display means to cause a temperature to be displayed to the user which is the lower of the temperatures sensed by said first and said second temperature sensing means.

81. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

15 humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

20 heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means,

25 gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases,

30 flow probe means adapted to sense the flow rate of said gases flow, and control means which receives input from said flow probe means and compares the sensed flow rate of said gases flow with a predetermined minimum required gases flow rate and places the humidification apparatus into a safe mode of operation if the sensed rate is less than said predetermined minimum rate.

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82. Humidification apparatus as claimed in claim 81 wherein said predetermined minimum required gases flow rate is about 1.5 litres per minute.

83. Humidification apparatus as claimed in claim 81 or claim 82 wherein heating plate temperature sensing means are also provided and said safe mode of operation includes said control means energising said heating means in such a way as to ensure that the temperature of said heating means does not exceed a predetermined maximum temperature.

84. Humidification apparatus as claimed in claim 81 or claim 82 wherein said safe mode of operation includes said control means limiting the power supplied to said heating means to a predetermined maximum level

85. Humidification apparatus as claimed in claim 81 or claim 82 wherein said flow probe means comprises:

sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

sensing means housed within said sensor housing means at or near said sensing end, and

at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

86. Humidification apparatus as claimed in claim 85 wherein said sensor probe means comprise two said projecting tab means.

87. Humidification apparatus as claimed in claim 85 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

88. Humidification apparatus as claimed in claim 85 wherein each said at least

one projecting tab means is aligned parallel to said gases flow.

89. Humidification apparatus means as claimed in claim 85 wherein liquid condensate is dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

90. Humidification apparatus means as claimed in claim 85 wherein said sensor probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

91. Humidification apparatus means as claimed in claim 90 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

92. Humidification apparatus means as claimed in claim 90 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow, and the power required by said sensor means of said flow rate sensor housing means to maintain said predetermined difference temperature providing an indication of the flow rate of said gases.

93. Humidification apparatus means as claimed in claim 90 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the flow rate sensor housing means while the sensing means of said temperature sensor housing means is encapsulated at or near the sensing end of the temperature sensor housing means.

94. Humidification apparatus means as claimed in claim 90 wherein said temperature and flow rate sensor housing means are spaced across said gases flow in order that heat produced by the sensing means of said flow rate sensor housing

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means has substantially minimal effect on the sensing means of said temperature sensor housing means.

5 95. Humidification apparatus means as claimed in claim 90 wherein said flow rate sensor housing means is positioned up stream of said temperature sensor housing means in order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

10 96. Humidification apparatus means as claimed in claim 85 wherein said gases flow is channelled within a conduit of known cross-sectional area, at least in the region adjacent said flow probe means, and is provided with a sensor entry port adapted to receive said flow probe means, said sensor entry port being provided with a fixed locating depression and said flow probe means being provided with a
15 complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing means relative to said gases flow being controlled by the interconnection of said locating depression and tooth.

20 97. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

25 heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means,

30 gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases, said gases transportation pathway means having a patient end, distal to said end connected to said outlet of said humidification

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chamber means,

humidity sensing means which senses the humidity of said gases flow being supplied to said patient,

timer means which may be used to time certain humidification apparatus events,

alarm means which may be energised to provide a warning signal after a predetermined alarm time,

storage means which stores said alarm times for a number of associated sensed humidity values, and

control means which stores a program which causes the control means to:

i) receive input of said sensed humidity value from said humidity sensing means,

ii) obtain from said storage means the alarm time associated with said sensed humidity value,

iii) start said timer means,

iv) wait until the time elapsed by said timer means substantially equals said alarm time and

v) energise said alarm means to provide said warning signal.

98. Humidification apparatus means as claimed in claim 97 wherein said alarm times stored in said storage means are greater for sensed humidity values which are nearer to a predetermined required humidity value and smaller for sensed humidity values which are further away from said predetermined required humidity value.

99. Humidification apparatus means as claimed in claim 98 wherein said storage means stores a number of sets of alarm times for a number of associated sensed humidity values, each set corresponding to individual said required humidity values.

100. Humidification apparatus means as claimed in claim 97 or claim 98 wherein said humidity sensing means comprise dew point sensing means.

101. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means,

heating means power utilisation sensing means which monitors the level of power being used by said heating means,

heating means temperature sensing means which senses the temperature of said heating means,

gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other person in need of such gases, said gases transportation pathway means having a patient end, distal to said end connected to said outlet of said humidification chamber means,

alarm means which may be energised to provide a warning signal after a predetermined alarm time, and

control means which stores a program which causes the control means to:

i) determine a difference temperature by subtracting the gases temperature determined by said gases flow temperature sensing means from the heating means temperature sensed by said heating means temperature sensing means,

ii) determine a power requirement value for the heating means from said heating means power utilisation sensing means,

iii) calculate a thermal conductivity value by dividing said power requirement value by said difference temperature,

iv) energise said alarm means if said calculated thermal conductivity value is less than a predetermined minimum allowable thermal conductivity value.

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102. Humidification apparatus means as claimed in claim 101 which also comprises flow probe means, adapted to sense the flow rate of said gases flow and storage means which stores a number of said predetermined minimum allowable thermal conductivity values with associated gases flow rates, and said control means is also programmed to carry out the step of

5 iiiia) determining the gases flow rate from said flow probe means and obtaining from said storage means the predetermined minimum allowable thermal conductivity value associated with the determined gases flow rate.

10 103. Humidification apparatus means as claimed in claim 101 or claim 102 wherein said control means is also programmed to carry out the step of

 v) waiting a predetermined period of time and then repeating steps (i) to (v).

15 104. Humidification apparatus as claimed in claim 102 wherein said flow probe means comprises:

 sensor housing means adapted for positioning in said gases flow, said sensor housing means having a longitudinal axis substantially perpendicular to said humidified gases flow and a sensing end,

20 sensing means housed within said sensor housing means at or near said sensing end, and

 at least one projecting tab means extending laterally from said sensor housing means, said at least one projecting tab means providing surfaces which enable liquid condensate to disperse away from said sensing end of said sensor housing means.

25 105. Humidification apparatus as claimed in claim 104 wherein said sensor probe means comprise two said projecting tab means.

30 106. Humidification apparatus as claimed in claim 104 or claim 105 wherein said two projecting tab means are oppositely positioned around said sensor housing means.

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107. Humidification apparatus as claimed in claim 104 or claim 105 wherein each said at least one projecting tab means is aligned parallel to said gases flow.

5 108. Humidification apparatus means as claimed in claim 104 or claim 105 wherein liquid condensate is dispersed along the lines of intersection between said sensor housing means and said at least one tab means, there existing a localised area of low surface tension along said lines of intersection.

10 109. Humidification apparatus means as claimed in claim 104 or claim 105 wherein said sensor probe means comprise two sensor housing means, a temperature sensor housing means and a flow rate sensor housing means.

15 110. Humidification apparatus means as claimed in claim 109 wherein said sensing means of said temperature sensor housing means and said flow rate sensor housing means each comprise a temperature dependent resistance.

20 111. Humidification apparatus means as claimed in claim 109 wherein said sensing means of said flow rate sensor housing means is occasionally heated to a predetermined difference temperature above the temperature of said gases flow, and the power required by said sensor means of said flow rate sensor housing means to maintain said predetermined difference temperature providing an indication of the flow rate of said gases.

25 112. Humidification apparatus means as claimed in claim 109 wherein said sensing means of said flow rate sensor housing means is exposed at or near the sensing end of the flow rate sensor housing means while the sensing means of said temperature sensor housing means is encapsulated at or near the sensing end of the temperature sensor housing means.

30 113. Humidification apparatus means as claimed in claim 109 wherein said temperature and flow rate sensor housing means are spaced across said gases flow in

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order that heat produced by the sensing means of said flow rate sensor housing means has substantially minimal effect on the sensing means of said temperature sensor housing means.

5 114. Humidification apparatus means as claimed in claim 109 wherein said flow rate sensor housing means is positioned up stream of said temperature sensor housing means in order that heat produced by the sensing means of said flow rate sensor housing means does not effect the sensing means of said temperature sensor housing means.

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115. Humidification apparatus means as claimed in claim 102 wherein said gases flow is channelled within a conduit of known cross-sectional area, at least in the region adjacent said flow probe means, and is provided with a sensor entry port adapted to receive said flow probe means, said sensor entry port being provided with a fixed locating depression and said flow probe means being provided with a complimentary fixed locating tooth, the positioning of said temperature and flow rate sensor housing means relative to said gases flow being controlled by the interconnection of said locating depression and tooth.

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20 116. Humidification apparatus for humidifying a gases flow to be supplied to a patient or other person in need of such gases comprising:

humidification chamber means adapted to hold a quantity of water and having an inlet and an outlet to allow said gases flow to pass through said humidification chamber means,

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heating means provided adjacent said humidification chamber means and adapted to provide heat to said quantity of water in said humidification chamber means in order to provide water vapour to said gases flow passing through said humidification chamber means, said heating means utilising a measurable quantity of power,

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gases transportation pathway means connected to said outlet of said humidification chamber means to convey said gases flow to said patient or other

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person in need of such gases,

gases transportation pathway heating means which are energisable to supply heat to said gases flow along at least a part of the length of said gases transportation pathway means,

5 gases temperature sensing means which senses the temperature of said gases flow leaving said humidification chamber means,

user input means to allow a user to enter a required temperature offset value which is the required difference in temperature between the said sensed gases temperature and the temperature of the gases flow delivered to said patient,

10 control means which stores a program which causes the control means to:

i) determine the gases temperature of the gases leaving said humidification chamber means using said gases temperature sensing means,

ii) receive said offset temperature value from said user input means,

15 iii) calculate an airway set-point temperature by adding said gases temperature to said offset temperature,

iv) energise said gases transportation pathway heating means to increase the temperature of said gases flow by said offset value along the length of said gases transportation pathway means.

20 117. Humidification apparatus means as claimed in claim 116 wherein said control means is also programmed to carry out the step of:

(iv) determining whether said offset temperature has been achieved along said gases transportation pathway means and if said offset temperature has not been achieved after a predetermined period of time then said heating means is controlled to reduce the temperature sensed by said gases temperature sensing means by a predetermined amount.

25 118. Humidification apparatus means as claimed in claim 116 wherein said control means is also programmed to carry out the step of:

30 vi) repeating steps (i) to (vi) until said offset temperature is maintained along said gases transportation pathway means.

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